

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005302667	A	20051027	JP 2004-120823	2004015
WO 2005101913	A1	20051027	WO 2005-JP6898	2005008
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
EP 1737277	A1	20061227	EP 2005-728719	2005008
R: DE, FR, GB, NL				
CN 1943278	A	20070404	CN 2005-80011361	2005008
US 20070202354	A1	20070830	US 2006-547233	2006003
IN 2006CN03792	A	20070622	IN 2006-CN3792	2006012
KR 2007004843	A	20070109	KR 2006-721357	2006013
PRIORITY APPLN. INFO.:				
			JP 2004-120823	A 2004015
			WO 2005-JP6898	W 2005008

OTHER SOURCE(S): MARPAT 143:429803

AB The invention relates to an organic electroluminescent device comprising an electroluminescent layer sandwiched between a pair of electrodes, wherein the electroluminescent layer comprises C10-100 aryl amine and a condensed ring-containing substance represented by (Ar)₁-L [Ar = C6-30 aromatic hydrocarbon and C3-30 aromatic heterocyclic; a = 2-6 integer; L = a valent condensed polycyclic aromatic residue].

IT 368884-56-4 693289-43-9 764657-27-4 868273-28-3
 868273-29-4 868273-30-7 868273-31-8 868273-32-9
 868273-33-0 868273-34-1 868273-35-2
 868273-36-3 868273-37-4

RL: DEV (Device component use); USES (Uses)
 (organic electroluminescent device)

L11 ANSWER 24 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2005:962579 HCAPLUS <<LOGINID::20090416>>

DOCUMENT NUMBER: 143:256816

TITLE: White organic electroluminescence device

INVENTOR(S): Tokairin, Hiroshi; Fukuoka, Kenichi; Kubota, Mayuki;
 Funahashi, Masakazu

PATENT ASSIGNEE(S): Idemitsu Kosan Co., Ltd., Japan

SOURCE: PCT Int. Appl., 63 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2005081587	A1	20050901	WO 2005-JP2442	2005017
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK,				

EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT,
RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML,
MR, NE, SN, TD, TG

EP 1718124 A1 20061102 EP 2005-719244 2005017
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
IE, SI, LT, FI, RO, CY, TR, BG, CZ, EE, HU, PL, SK, IS

CN 1879454 A 20061213 CN 2005-80001270 2005017
US 20070063638 A1 20070322 US 2006-573661 2006008
KR 2006115372 A 20061108 KR 2006-708168 2006007
PRIORITY APPLN. INFO.: JP 2004-42694 A 2004019
WO 2005-JP2442 W 2005017

AB The invention refers to a white organic electroluminescence device comprising a neg. electrode and a pos. electrode and, interposed there between one or more organic thin film layers including at least a light emitting layer, wherein the light emitting layer is constituted of a laminate of blue color light emitting layer and yellow-to-red color light emitting layer and contains an asym. condensed-ring-containing compound. This white color organic electroluminescence device realizes reduced chromaticity changes and excels in luminous efficiency and thermal stability, ensuring strikingly prolonged service life.

REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

IT 154853-83-5 331965-31-2 667940-34-3 667940-36-5
764657-26-3 853945-27-4 853945-29-6
853945-34-3 855828-33-0 863292-27-7
863292-28-8 863292-29-9

RL: DEV (Device component use); USES (Uses)
(white color organic electroluminescence device)

L11 ANSWER 25 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2004:1035604 HCAPLUS <<LOGINID::20090416>>

DOCUMENT NUMBER: 142:29757

TITLE: Dibenzospiro compounds, their organic solutions for manufacture of luminescent films, and blue-emitting organic electroluminescent devices using them

INVENTOR(S): Inoue, Tetsuya; Ikeda, Shuji; Hosokawa, Chishio

PATENT ASSIGNEE(S): Idemitsu Kosan Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 49 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004339136	A	20041202	JP 2003-136838	2003015
WO 2004110968	A1	20041223	WO 2004-JP6331	2004000
W:				
AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW				
RW:				
BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
EP 1623968	A1	20060208	EP 2004-730688	2004000
R:				
AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI, RO, CY, TR, BG, CZ, EE, HU, PL, SK				
CN 1791567	A	20060621	CN 2004-80013354	2004000

US 20070042220 A1 20070222 US 2005-556530 2005114
PRIORITY APPLN. INFO.: JP 2003-136838 A 2003015
WO 2004-JP6331 W 2004000

OTHER SOURCE(S): MARPAT 142:29757

AB The compds. are (Sp)nXYm [Sp = dibenzospiro groups I; L = single bond, (CR'R'')e, (SiR'R'')e, O, CO, NR'; R', R'' = H, 6-50-membered aromatic group, 5-50-membered aromatic heterocyclylene, C1-50 alkyl; Z = C, Si, Ge, Q = groups necessary for forming cyclic structure; R = 6-50-membered aromatic group, 5-50-membered aromatic heterocyclyl, C1-50 alkyl, etc.; X = 6-50-membered aromatic group, 12-20-membered condensed aromatic group, 5-50-membered aromatic heterocyclylene other than (poly)anthracenedyl; Y = (vinyl linkage-containing) 6-50-membered aromatic group; a, b = 0-4 e = 1-10; m = 0-2; n = 1-4]. The compds. show good heat resistance and organic solvent solubility. Thus, di(spiroindanefluorenyl)benzene II was manufactured and used for a blue-emitting organic electroluminescent device.

IT 799560-00-2P 799560-15-9P 799560-18-2P
799560-29-5P 799560-31-9P 799560-33-1P
RL: DEV (Device component use); IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses) (manufacture of dibenzospiro compds. showing good heat resistance and organic solvent solubility as emitter layers for blue-emitting organic electroluminescent devices)

IT 110-52-1, 1,4-Dibromobutane 218-01-9, Chrysene 624-38-4,
1,4-Diodobenzene 1133-80-8, 2-Bromofluorene 14923-84-3,
1,6-Diaminopyrene 16433-88-8, 2,7-Dibromofluorene 22362-86-3,
9-Iodoanthracene 38622-14-9, a,a'-Dibromoxylene
117695-55-3 288105-04-4
RL: RCT (Reactant); RACT (Reactant or reagent)
(manufacture of dibenzospiro compds. showing good heat resistance and organic solvent solubility as emitter layers for blue-emitting organic electroluminescent devices)

L11 ANSWER 26 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN
ACCESSION NUMBER: 2004:606600 HCAPLUS <<LOGINID::20090416>>
DOCUMENT NUMBER: 141:164539
TITLE: Backlight polar organic light-emitting device
INVENTOR(S): Lazarev, Pavel I.
PATENT ASSIGNEE(S): Optiva, Inc., USA
SOURCE: PCT Int. Appl., 45 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2004064112	A2	20040729	WO 2004-US229	2004006
WO 2004064112	A3	20050317		

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ

US 20040224182	A1	20041111	US 2003-643257	2003018
JP 2006516814	T	20060706	JP 2006-500803	2004006

PRIORITY APPLN. INFO.: US 2003-438714P P 2003007
US 2003-643257 A 2003018
WO 2004-US229 W 2004006

AB An organic light-emitting device (OLED) is provided which comprises a substrate and an organic electroluminescent cell formed on the substrate. The organic electroluminescent cell comprises a first electrode that serves as an anode, a second electrode that serves as a cathode, and at least one light-emitting layer positioned between the anode and cathode. At least

3/18/2003

one light-emitting layer is an anisotropic elec. conducting layer which has a globally ordered crystalline structure and is comprised of ~~like~~ supramols.

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE TO THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

IT 80-76-2 91-94-1, 3,3'-Dichlorobenzidine 101-54-2 128-69-8,
3,4,9,10-Perylenetetracarboxylic dianhydride 131-14-6,
2,6-Diaminoanthraquinone 537-65-5, Bis(p-aminophenyl)amine 6034-7,
2,7-Diaminoanthraquinone 1314-13-2, Zinc oxide, uses 2243-62-1,
1,5-Diaminonaphthalene 2425-95-8 2915-84-6, 2,7-Diaminofluorene
4117-90-2 5981-09-9, Tris(p-aminophenyl)amine 6259-19-4 76849-4,
Sodium fluoride, uses 7789-23-3, Potassium fluoride 7789-24-4 Lithium
fluoride, uses 12007-99-7, Calcium hexaboride 13400-13-0, Cesium
fluoride 13446-74-7, Rubidium fluoride 14923-84-3,
1,6-Diaminopyrene 25764-10-7, Lanthanum nitride (LaN) 26009-24-5, PPV
50926-11-9, ITO 65181-78-4 118040-54-3 123847-85-8 135704-45-0
RL: DEV (Device component use); TEM (Technical or engineered material
use); USES (Uses)
(backlight polar organic light-emitting device)
IT 517-51-1, 5,6,11,12-Tetraphenylanthracene 1499-10-1,
9,10-Diphenylanthracene
RL: DEV (Device component use); TEM (Technical or engineered material
use); USES (Uses)
(mixture containing triphenylamine tetramer; backlight polar organic
light-emitting device)

L11 ANSWER 27 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2004:568210 HCAPLUS <<LOGINID::20090416>>

DOCUMENT NUMBER: 141:131023

TITLE: Organic electroluminescent devices employing
blue-emitting dopants based on amine derivative of
pyrene

INVENTOR(S): Seo, Jeong Dae; Lee, Kyung Hoon; Kim, Hee Jung; Park,
Chun Gun; Oh, Hyoung Yun

PATENT ASSIGNEE(S): Lg Electronics Inc., S. Korea

SOURCE: Eur. Pat. Appl., 43 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1437395	A2	20040714	EP 2003-29661	2003223
EP 1437395	A3	20050831		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
KR 2004057862	A	20040702	KR 2003-20465	2003001
US 20040137270	A1	20040715	US 2003-743778	2003224
JP 2004204238	A	20040722	JP 2003-428297	2003224
JP 3926791	B2	20070606		
CN 1535089	A	20041006	CN 2003-10124405	2003224
JP 2007027779	A	20070201	JP 2006-245563	2006001
PRIORITY APPLN. INFO.:			KR 2002-83279	A 2002224
			KR 2003-20465	A 2003001
			JP 2003-428297	A3 2003224

OTHER SOURCE(S): MARPAT 141:131023

AB Organic electroluminescent devices are described which comprise a substrate;
a first and second electrodes formed on the substrate; an emitting layer
formed between the first electrode and the second electrode, the emitting
layer having a plurality of materials one of which being a blue-emitting
dopant with general formula (I), where at least one of A1 and A2 is

selected from a substituted or non-substituted aromatic group, a heterocyclic group, an aliphatic group and hydrogen. The materials forming the emitting layer together with the material of I may have a chemical formula I-BX-B2 where X is selected from a group consisting of naphthalene, anthracene, phenanthrene, pyrene, perylene, and quinoline and at least 1 of the B1 and B2 is selected from a group consisting of aryl, alkylaryl, alkoxyaryl, arylaminoaryl and alkylaminoaryl.

REFERENCE COUNT: 1 THERE ARE 1 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

IT 76656-51-4 143141-30-4 163969-53-7
 663954-33-4 668019-96-3 722498-76-2
 722498-77-3 722498-78-4 722498-79-5
 722498-80-8 722498-81-9 722498-82-0
 722498-83-1 722498-84-2 722498-85-3
 722498-86-4 722498-87-5 722498-88-6
 722498-89-7 722498-90-0 722498-91-1
 722498-92-2 722498-93-3 722498-94-4
 722498-95-5 722498-97-7 722498-98-8
 722498-99-9 722499-00-5 722499-01-6
 722499-02-7 722499-03-8 722499-04-9
 722499-05-0 722499-06-1 722499-07-2
 722499-08-3 722499-09-4 722499-10-7
 722499-11-8 722499-12-9 722499-13-0
 722499-14-1 722499-15-2 722499-16-3
 722499-17-4 722499-18-5 722499-19-6
 722499-20-9 722499-21-0 722499-22-1
 722499-23-2 722499-24-3 722499-25-4
 722499-26-5 722499-27-6 722499-28-7
 722499-29-8 722499-30-1 722499-31-2
 722499-32-3 722499-33-4 722499-34-5
 722499-35-6 722499-36-7 722499-37-8
 722499-38-9 722499-39-0 722499-40-3
 722499-41-4 722499-42-5 722499-43-6
 722499-44-7 722499-45-8 722499-46-9
 722499-47-0 722499-48-1 722499-49-2
 722499-50-5 722499-51-6 722499-52-7
 722499-53-8 722499-54-9

RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)

(blue-emitting dopant; organic electroluminescent devices employing blue-emitting dopants based on amine derivs. of pyrene)

IT 722498-96-6

RL: DEV (Device component use); MOA (Modifier or additive use); PRP (Properties); USES (Uses)

(blue-emitting dopant; organic electroluminescent devices employing blue-emitting dopants based on amine derivs. of pyrene)

IT 722498-52-4P 722498-53-5P 722498-55-7P

RL: DEV (Device component use); MOA (Modifier or additive use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(blue-emitting dopant; organic electroluminescent devices employing blue-emitting dopants based on amine derivs. of pyrene)

IT 188-71-6, Pentabenz[a,de,kl,o,rst]pentaphene 26979-27-1

43069-36-9 55009-75-1 331749-28-1 400606-81-7

626236-19-9 653599-45-2 653599-46-3

722498-56-8 722498-57-9 722498-58-0

722498-59-1 722498-60-4 722498-61-5

722498-62-6 722498-64-8 722498-65-9

722498-66-0 722498-67-1 722498-68-2 722498-69-3

722498-70-6 722498-71-7 722498-72-8 722498-73-9 722498-74-0

722498-75-1

RL: DEV (Device component use); USES (Uses)

(light-emitting host; organic electroluminescent devices employing blue-emitting dopants based on amine derivs. of pyrene)

IT 722498-63-7
 RL: DEV (Device component use); PRP (Properties); USES (Uses)
 (light-emitting host; organic electroluminescent devices employing
 blue-emitting dopants based on amine derivs. of pyrene)

IT 76656-53-6P
 RL: SPN (Synthetic preparation); TEM (Technical or engineered material
 use); PREP (Preparation); USES (Uses)
 (organic electroluminescent devices employing blue-emitting dopants based
 on amine derivs. of pyrene)

L11 ANSWER 28 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN
 ACCESSION NUMBER: 2004:198497 HCAPLUS <<LOGINID::20090416>>
 DOCUMENT NUMBER: 140:225545
 TITLE: Phenylanthracenes for blue-emitting organic
 electroluminescent devices having high luminescent
 intensity and efficiency
 INVENTOR(S): Kawamura, Hisayuki
 PATENT ASSIGNEE(S): Idemitsu Kosan Co., Ltd., Japan
 SOURCE: Jpn. Kokai Tokkyo Koho, 24 pp.
 CODEN: JKXXAF
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004075580	A	20040311	JP 2002-235538	2002013
JP 4065161	B2	20080319		

PRIORITY APPLN. INFO.: JP 2002-235538 2002013
 OTHER SOURCE(S): MARPAT 140:225545
 AB The phenylanthracenes are A1LA2 (I) (A1, A2 = phenylanthryl,
 diphenylanthryl; L = C⁸ polycyclic alicyclic group; A1 and A2 link
 via different atoms of L). Organic electroluminescent devices have emitter
 or hole-transporting layers containing I.

IT 154853-83-5 663954-33-4
 RL: DEV (Device component use); MOA (Modifier or additive use); USE
 (Uses)
 (dopants; polycyclic alicyclic compds. bearing phenylanthracene groups
 as emitters or hole transporting materials for blue-emitting organic
 electroluminescent devices)

IT 665054-19-3P 665054-20-6P
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (manufacture of polycyclic alicyclic compds. bearing phenylanthracene groups
 as emitters or hole transporting materials for blue-emitting organic
 electroluminescent devices)

IT 23674-20-6P 625854-02-6P
 RL: IMF (Industrial manufacture); RCT (Reactant); PREP (Preparation); RACT
 (Reactant or reagent)
 (manufacture of polycyclic alicyclic compds. bearing phenylanthracene groups
 as emitters or hole transporting materials for blue-emitting organic
 electroluminescent devices)

L11 ANSWER 29 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN
 ACCESSION NUMBER: 2004:182957 HCAPLUS <<LOGINID::20090416>>
 DOCUMENT NUMBER: 140:243296
 TITLE: Organic electroluminescent devices and organic
 luminescent medium
 INVENTOR(S): Matsuura, Masahide; Funahashi, Masakazu; Fukuda,
 Kenichi; Hosokawa, Chishio
 PATENT ASSIGNEE(S): Idemitsu Kosan Co., Ltd., Japan
 SOURCE: PCT Int. Appl., 77 pp.

CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2004018588	A1	20040304	WO 2003-JP8463	2003003
W: CN, JP, KR				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR				
EP 1541657	A1	20050615	EP 2003-738656	2003003
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI, RO, CY, TR, BG, CZ, EE, HU, SK				
CN 1668719	A	20050914	CN 2003-817301	2003003
CN 1323128	C	20070627		
CN 1842234	A	20061004	CN 2006-10067808	2003003
CN 101068041	A	20071107	CN 2007-10101150	2003003
TW 278248	B	20070401	TW 2003-92118623	2003008
US 20050064233	A1	20050324	US 2003-617397	2003011
US 20060033421	A1	20060216	US 2005-207933	2003022
US 20070237984	A1	20071011	US 2007-761437	2003012
JP 2008205491	A	20080904	JP 2008-75542	2008024
JP 2008291263	A	20081204	JP 2008-159055	2008018
JP 4221050	B2	20090212		

PRIORITY APPLN. INFO.:
JP 2002-211308 A 2002019
CN 2003-817301 A3 2003003
JP 2004-530527 A3 2003003
WO 2003-JP8463 W 2003003
US 2003-617397 A3 2003011
US 2005-207933 A1 2003022

OTHER SOURCE(S): MARPAT 140:243296

AB An organic electroluminescent device comprises a pair of electrodes and an organic luminescent medium layer which is placed between the electrodes and contains (A) a specific arylamine and (B) at least one compound selected from among specific anthracene derivs., spiro fluorene derivs., fused-ring compds., and metal complexes; and an organic luminescent medium containing the components (A) and (B). The organic electroluminescent device exhibits high color purity, excellent heat resistance and a long lifetime and emits blue to yellow light at high efficiency, and the organic luminescent medium is suitable for use in such devices.

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE ON THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

IT 76656-53-6 122648-99-1 131625-67-7 171408-93-8
172285-79-9 172285-83-5 220721-68-6 244281-01-4
279672-22-9 349666-25-7 400606-81-7 475461-15-5
668019-24-7 668019-64-5 668019-76-9 668019-96-3
668020-07-3 668020-14-2 668020-20-0 668020-26-6
668020-28-8 668020-34-6 668020-39-1 668020-46-0 668020-53-9
668020-61-9 668020-67-5 668020-74-4 668020-81-3
668020-88-0

RL: DEV (Device component use); USES (Uses)
(organic electroluminescent devices and organic luminescent medium)

L11 ANSWER 30 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN
ACCESSION NUMBER: 2004:162657 HCAPLUS <<LOGINID::20090416>>
DOCUMENT NUMBER: 140:225502
TITLE: Oligoarylene derivatives for organic electroluminescent devices
INVENTOR(S): Ikeda, Hidetsugu; Matsuura, Masahide; Kawamura, Hisayuki
PATENT ASSIGNEE(S): Idemitsu Kosan Co., Ltd., Japan

SOURCE: PCT Int. Appl., 35 pp.
 CODEN: PIXXD2
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2004016575	A1	20040226	WO 2003-JP10071	2003007
W: CN, KR, US				
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR				
JP 2004075567	A	20040311	JP 2002-234833	2002012
EP 1533290	A1	20050525	EP 2003-788055	2003007
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI, RO, CY, TR, BG, CZ, EE, HU, SK				
CN 1675149	A	20050928	CN 2003-819058	2003007
TW 287408	B	20070921	TW 2003-92122023	2003011
US 20060134456	A1	20060622	US 2005-522546	2005027
US 7429425	B2	20080930		
US 20090009073	A1	20090108	US 2008-208237	2008010
US 20090009074	A1	20090108	US 2008-208253	2008010
PRIORITY APPLN. INFO.:			JP 2002-234833	A 2002012
			WO 2003-JP10071	W 2003007
			US 2005-522546	A1 2005027

OTHER SOURCE(S): MARPAT 140:225502

AB The invention relates to oligoarylene derivs. represented by Ar1-ChAr2, Ch1-L-Ch2, Ar3-(L1)a-Ch3-(L2)b-Ar4, and Ar5-Ch4-(Ar7)n-L3-(Ar8)m-Ch5-Ar6(1) [Ch, Ch1 and Ch2 = C14-20 condensed aromatic ring; Ch3, Ch4 and Ch5 = C14-20 arylene group; Ar1-6 = aryl group containing 5-30 atoms; Ar7 and Ar8 = arylene group containing 5-30 atoms; L1-3 = connecting group; and a, b, n and m = 0 or 1]. The oligoarylene derivs. are suited for use as a host material of a blue electroluminescent material in an organic electroluminescent device.

REFERENCE COUNT: 2 THERE ARE 2 CITED REFERENCES AVAILABLE TO THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

IT 154853-83-5P 663954-28-7P 663954-29-8P 663954-30-1P
 663954-32-3P 663954-33-4P
 RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
 (oligoarylene derivs. for organic electroluminescent devices)

L11 ANSWER 31 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2003:173103 HCAPLUS <<LOGINID::20090416>>

DOCUMENT NUMBER: 138:212613

TITLE: Condensed eight-ring aromatic compounds, organic electroluminescent element and organic electroluminescent display using the same

INVENTOR(S): Sotoyama, Wataru; Sato, Hiroyuki; Matsuura, Azma; Narusawa, Toshiaki

PATENT ASSIGNEE(S): Fujitsu Limited, Japan

SOURCE: Eur. Pat. Appl., 46 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1289343	A1	20030305	EP 2002-252258	2002027
EP 1289343	B1	20070523		

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC,PT,
 IE, SI, LT, LV, FI, RO, MK, CY, AL, TR

JP 2003151775	A	20030523	JP 2001-361504	2001127
JP 4024526	B2	20071219		
KR 854881	B1	20080828	KR 2002-14971	2002020
TW 552826	B	20030911	TW 2002-91105423	2002021
US 20030082404	A1	20030501	US 2002-104013	2002025
US 6805977	B2	20041019		
CN 1403427	A	20030319	CN 2002-108709	2002029
CN 1239446	C	20060201		

PRIORITY APPLN. INFO.: JP 2001-259684 A 2001029
 JP 2001-361504 A 2001127

OTHER SOURCE(S): MARPAT 138:212613

AB Organic electroluminescent elements comprising an organic thin-film layer including a light-emitting layer in between a pos. electrode and neg. electrode are described in which the organic thin-film layer contains a condensed eight-ring aromatic compound with a structure which has 4, 16, or 18 regions where substituents can be introduced and a point-sym. carbon skeleton. Selected substituted condensed eight-ring aromatic compounds are claimed. Displays employing the electroluminescent elements are also described.

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

IT 1055073-01-2 1055073-02-3 1055073-03-4

RL: PRPH (Prophetic)

(Condensed eight-ring aromatic compounds, organic electroluminescent element and organic electroluminescent display using the same)

IT 517-51-1, Rubrene

RL: DEV (Device component use); MOA (Modifier or additive use); USE (Uses)

(condensed eight-ring aromatic compds. and organic electroluminescent elements and displays using them)

IT 500556-74-1P 500556-77-4P 500556-78-5P 500556-79-6P

500556-81-0P 500556-82-1P 500556-83-2P 500556-85-4P

500556-86-5P

RL: DEV (Device component use); MOA (Modifier or additive use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)

(condensed eight-ring aromatic compds. and organic electroluminescent elements and displays using them)

L11 ANSWER 32 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2002:964695 HCAPLUS <<LOGINID::20090416>>

DOCUMENT NUMBER: 138:47036

TITLE: Organic electroluminescence device with gallium quinolinato complex and styryl arylene host

INVENTOR(S): Hosokawa, Chishio; Funahashi, Masakazu; Sakai, Toshio; Arakane, Takashi; Yamamoto, Hiroshi

PATENT ASSIGNEE(S): Idemitsu Kosan Co., Ltd., Japan

SOURCE: PCT Int. Appl., 73 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002102118	A1	20021219	WO 2002-JP4427	2002007
W: CN, IN, JP, KR				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR				
EP 1404160	A1	20040331	EP 2002-724697	2002007
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,				

IE, SI, LT, LV, FI, RO, MK, CY, AL, TR

CN 1513283	A	20040714	CN 2002-811332	2002007
CN 100431193	C	20081105		
JP 4029071	B2	20080109	JP 2003-504716	2002007
US 20030077480	A1	20030424	US 2002-141982	2002010
TW 286911	B	20070911	TW 2002-91109908	2002013
US 20050227111	A1	20051013	US 2004-935102	2004008
US 7087322	B2	20060808		
US 20060257687	A1	20061116	US 2006-480469	2006005

PRIORITY APPLN. INFO.:
 JP 2001-170960 A 2001006
 WO 2002-JP4427 W 2002007
 US 2002-141982 B1 2002010
 US 2004-935102 A3 2004008

AB The invention refers to an organic electroluminescence device comprising at least one organic thin-film layer with a laminate containing a meta complex with energy gap > 2.8 eV, and a host material layer. The electroluminescence device exhibits a high luminance and has high emission efficiency and a long life.

REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE TO THIS RECORD. ALL CITATIONS AVAILABLE IN THE REFORMAT

IT 23102-67-2 186412-15-7 221453-38-9 279672-58-1
 403671-71-6 403671-73-8 478702-59-9 478702-60-2
 RL: DEV (Device component use); USES (Uses)
 (organic electroluminescence device with gallium quinolinato complex and styryl arylene host)

L11 ANSWER 33 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN
 ACCESSION NUMBER: 2002:313483 HCAPLUS <<LOGINID::20090416>>
 DOCUMENT NUMBER: 136:332524
 TITLE: Organic electroluminescent devices
 INVENTOR(S): Hosokawa, Chishio; Funahashi, Masakazu
 PATENT ASSIGNEE(S): Idemitsu Kosan Co., Ltd., Japan
 SOURCE: Jpn. Kokai Tokkyo Koho, 20 pp.
 CODEN: JKXXAF
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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JP 2002124385	A	20020426	JP 2000-319265	2000019
PRIORITY APPLN. INFO.:			JP 2000-319265	2000019

OTHER SOURCE(S): MARPAT 136:332524

AB The devices comprise a pair of electrodes interposing an organic electroluminescent laminate containing a phosphor layer comprising a polyarom. hydrocarbon ring.

IT 2085-33-8, Tris(8-quinolinolato)aluminum 7439-93-2, Lithium, uses
 50926-11-9, ITO 65181-78-4, TPD 123847-85-8, a-NPD 274256-88-
 415683-03-3 415683-04-4 415683-05-5 415683-06-6
 415683-07-7 415683-08-8 415683-09-9 415683-10-2 415683-11-3
 415683-13-5
 RL: DEV (Device component use); USES (Uses)
 (organic electroluminescent devices)

L11 ANSWER 34 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN
 ACCESSION NUMBER: 1967:120492 HCAPLUS <<LOGINID::20090416>>
 DOCUMENT NUMBER: 66:120492
 ORIGINAL REFERENCE NO.: 66:22375a,22378a
 TITLE: Oxidation, reduction, and electrochemiluminescence of donor-substituted polycyclic aromatic hydrocarbons
 AUTHOR(S): Zweig, Arnold; Maurer, Arthur H.; Roberts, Bernard George

CORPORATE SOURCE: American Cyanamid Co., Stamford, CT, USA
SOURCE: Journal of Organic Chemistry (1967), 32(5), 132-9
CODEN: JOCEAH; ISSN: 0022-3263
DOCUMENT TYPE: Journal
LANGUAGE: English

AB The effect of chemical structure on electrochemiluminescence (E.C.L) and the mol. properties associated with this phenomenon have been explored. Polarographic oxidation and reduction potentials and the fluorescence emission spectra in aprotic media of donor-substituted polycyclic aromatic compounds were measured. The stabilities of ion radicals generated from these compounds were determined by means of cyclic voltammetry. The results are in general agreement with the assumption that the efficiency of the E.L. process is associated with the fluorescence, efficiency, and stability of the one-electron oxidation and reduction products under the experimental conditions. While multiple donor substituents on polycyclic aromatic nuclei result in fluorescent compounds with stable cations, the orientation of such substituents which is most effective in stabilizing the cation also results in extensive anion destabilization. The results are discussed in terms of the M.O. theory. 42 references.

IT 86-56-6 91-20-3, Naphthalene, properties 92-52-4, properties 93-04-9
120-12-7, properties 129-00-0, properties 366-29-0 613-37-6
2132-80-1 2216-69-5 2395-96-2 2395-97-3 2436-85-3 3469-20
3900-49-0 4877-93-4 5309-18-2 5486-55-5 5710-05-4
6161-50-8 7343-31-9 7343-32-0 7433-79-6 10075-61-3 10075-52-4
10075-63-5 10075-66-8 10075-68-0 10075-69-1 10075-70-4
10075-71-5 10075-72-6 10075-73-7 10075-74-8 10075-76-0
10075-77-1 10075-78-2 10075-80-6 10075-81-7 10075-83-9
10075-84-0 10075-85-1 10075-86-2 10075-90-8 10075-91-9
10075-93-1 10075-94-2 10075-95-3 10103-06-7 10103-10-3
10294-75-4

RL: PRP (Properties)
(electrochemiluminescence and polarography of)

L11 ANSWER 35 OF 35 HCAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1938:906 HCAPLUS <<LOGINID::20090416>>
DOCUMENT NUMBER: 32:906
ORIGINAL REFERENCE NO.: 32:145i,146a-i,147a-i,148a-i,149a-i,150a-i,151a-i,152a-e

TITLE: Pyrene and its derivatives
AUTHOR(S): Vollmann, Heinrich; Becker, Hans; Corell, Martin;
Streeck, Hans; Langbein, G.
SOURCE: Justus Liebigs Annalen der Chemie (1937), 531,1-159
CODEN: JLACBF; ISSN: 0075-4617
DOCUMENT TYPE: Journal
LANGUAGE: Unavailable
OTHER SOURCE(S): CASREACT 32:906

AB This article is a comprehensive review of the chemical of pyrene (I) and its derivs. The Richter system of numbering the C atoms is used. Oxidation of I with aqueous H₂SO₄ and K₂Cr₂O₇ gives 90% of pyrene-3,8- (II) and -3,10-quinones (III) in about the ratio of 1:2. While II may be separated directly from the oxidation mixture (crystallization successively from AcOH, PhCl

and PhNO₂), it is best obtained through reduction to the dihydroxypyrenes (IV) and reoxidn. of the difficultly soluble (dilute EtOH) portion to II. II also results in 80% yield by catalytic reduction of 2,5,7,10-tetrachloropyrenequinone (with Ni) in 6% NaOH at 50 atmospheres and 130° for 90 min., IV being an intermediate product. The purification of III is difficult, owing to its greater solubility and to the presence of other oxidation products; the crude IV, after separation of the 3,8-isomer, is transformed into the di-Ac derivative, which is then saponification and oxidized to III. II, brownish golden yellow, from PhNO₂, m. 309°; III, dark red, from AcOH, m. 270°. On further oxidation, both II and III yield first 1,8-naphthindenone-4,5-dicarboxylic acid (V) [the pyrenic acid of

Bamberger and Philip (Ann. 240, 107(1887))], purified through the anhydride, golden yellow, m. 174°, and finally naphthalene-1,4,5,8-tetracarboxylic acid. Dry distillation of the salt of V yields the "pyrene ketone" of B. and P., which is identical with 1,8-naphthindene (German pat. 283,066 (C. A. 9, 2599); Cook and Wett (C. A. 28, 3413.3)). The structure of II was definitely established by its preparation from 3,8-dibenzoylpyrene. II and III form bright yellow vats, with only slight affinities for vegetable and animal fibers. I (10 g.) in 1 l. CCl₄, treated at 20-30° with 67 g. SO₂Cl₂ in 200 cc. CCl₄, gives 80 g. of the 3-Cl derivative, m. 119°. I and Cl₂ in C₂H₂Cl₄ at 60° give, after several hrs., 90% of 3,5,8,10-tetrachloropyrene (VI), yellow, m. 365°; this also results in 36% yield from 38 g. tetranitropyrene and PCl₅ in C₆H₃Cl₃ on refluxing 5 h. Br₂ and Im PhNO₂, heated 2 h. at 120° and 2 h. at 120-30°, give 94-6% of the 3,5,8,10-tetra-Br derivative (VII), pale yellow, m. 402°. H₂O action of 20% oleum at 85° upon 34 g. VI gives 29.7 g. of crude 5,10-dichloropyrene-3,8-quinone (VIII), purified by crystallization from AcOH and sublimation at 400° (final yield, 5 g.), while catalytic dehalogenation of 2,5,7,10-tetrachloropyrene-3,8-quinone (VIIIa) gives 80% of pure VIII, orange-yellow, m. 278°; the hydrosulfite vat is yellow. When 170 g. VI are stirred with 1100 cc. 20% oleum at 80° for 40 min., then treated with 260 cc. H₂SO₄ (60° B. act. e.) and the resulting 98% H₂SO₄ solution heated 0.5 h. at 200°, there results 94% of 3,5,8,10-tetraoxo-3,4,5,8,9,10-hexahydropyrene (IX), which is the naphthalene-1,8,4,5-diindandione of Freund and Fleischer (C. A. 8, 663); IX also results in 95% yield by refluxing 180 g. X in 4 l. 10% NaOH and 200 g. Zn for 5 h.; it is purified by crystallization of the sulfate from 80% H₂SO₄ and decomposition with H₂O. VII (200 g.) in 2 l. concentrated H₂SO₄, warmed

to

140-50° for 4 h., gives 93% of 4,9-dibromo-3,5,8,10-tetraoxo-3,4,5,8,9,10-hexahydropyrene (X), dark red; solution in PhNO₂ is accompanied by loss of HBr. Addition of NaOH to an aqueous suspension of X yields a brownish gray Na salt; hydrosulfite gives a light yellow vat, from which HCl ppts. 4,9-dibromo-3,5,8,10-tetrahydroxyrene. X with 40 parts Ac₂O (and a trace of concentrated H₂SO₄) gives an orange-red product, probably 3,8-diacetoxy-4,9-dibromopyrene-5,10-quinone. A fine suspension of 10 g. IX in 100 cc. PhNMe₂ and 20 g. BzCl, on gentle boiling, give 12 g. of the tetra-Bz derivative (XI), pale yellow, m. 340° (decomposition), of 3,5,8,10-tetrahydroxyrene, nearly colorless, which is fairly stable in air and may be recrystd. from C₆H₃Cl₃ containing a little PhNHNH₂; it also results by acidifying a vat of IX in excess hydrosulfite. Similarly, X yields the 4,9-di-Br derivative of XI, pale yellow, m. above 370° (decomposition). IX (33 g.) and 20 g. NaNO₂ in 1 l. 2% NaOH, treated with 1 l. 6% H₂SO₄ at 30°, give 35.8 g. of the 4,9-dinitroso derivative (XII) of IX, light yellowish gray, decomps. above 200°; dilute NaOH gives a very difficultly soluble Na salt; hydrosulfite yields a clear brownish yellow vat, changing on shaking with air to red-violet and finally to a blue-violet. IX (40 g.) and 200 cc. HNO₃ (d. 1.4), boiled for a short time, give 30 g. of the 4,9-di-NO₂ derivative, (XIII) of IX, golden yellow; this also results in 35 g. yield from 44 g. IX and 150 cc. HNO₃ at 40-50° for 20 min. Hydrosulfite reduction of XIII gives the 4,9-di-NH₂ derivative of IX, which yields a Na salt giving a violet-blue aqueous solution; the concentrated H₂SO₄ solution is brownish orange. IX (13 g.)

and Cl

in dilute HCl give 16.6 g. (crude yield) of the 4,4,9,9-tetra-Cl derivative, light brown, decomps. above 340°; NaOH in the cold splits off CHCl₃ and further oxidation with NaOCl gives a good yield of 1,4,5,8-Cl₄(CO₂H)₄. The 4,4,9,9-tetra-Br analog, from X, is golden yellow and decomps. above 250°. Exhaustive chlorination of I in C₆H₃Cl₃ at 100-10° gives 60-4% of 1,2,3,5,6,7-8,10-octachloro-1,2,6,7-tetrahydropyrene (XIV), m. 292° (evolution of HCl); heating XIV at 400° gives 95% of hexachloropyrene (XV), yellow, m. 383° (probably a mixture of 2 isomers); this also results in 100% yield by refluxing XIV with alkali in

EtOH; it is insol. in cold concentrated H₂SO₄; 20% oleum gives a ~~red~~ to violet solution; warming the solution splits off a part of the Cl. VIIIA (50 g.) and 700 cc. concentrated H₂SO₄, heated 10 min. at 100°, treated with 75 cc. HNO₃ (d. 1.5) and heated at 170°, give 30 g. of the dianhydride (XVI), m. 385-90°, of 2,7,1,4,5,8-Cl₂C₁₀H₂(CO₂H)₄. The mixed XV (41 g.), warmed with 400 cc. of 20% oleum at 80-90° for 1 h., then treated with 240 cc. H₂SO₄ (60° B. act. e.) and then dropwise with 60 cc. HNO₃ (d. 1.5), gives 23-5 g. of a mixture of XVI and the 2,7-isomer (XVII); 100 g. of the mixture yields 30 g. XVI and 30 g. XVII, m. 296°; XVII results in 17-g. yield by alkaline KMnO₄ oxidation of 3,8-dichloroacenaphthene-5,6-dicarboxylic anhydride, m. 274° [prepared by chlorination of acenaphthalic anhydride (German pat. 557,665 (C. A. 27, 608) English pat. 393,158 (C. A. 27, 5988)) in ClSO₃H at 30° for 1 h.]. Warming XVII with PhNH₂ gives a carmine-red solution while XVI gives a pure blue solution. From the C₆H₃Cl₃ mother liquor of XIV (especially after it had been used repeatedly for the preparation of XIV) there was isolated 1,2,3,5,6,7,8,10-octachloropyrene (XVIII), yellow, m. 238°. Chlorination of 75 g. of the mixed XV in ClSO₃H (I as catalyst) yields 75 g. of perchlorohydroxyrene, C₁₆H₂Cl₁₄, decomp. 260° (gas evolution) and forms decachloropyrene (XIX), C₁₆Cl₁₀, yellow, m. 264°. Oxidation of XIX in H₂SO₄ with HNO₃ (d. 1.5) gives 25% of 2,3,6,7-tetrachloronaphthalenetetracarboxylic dianhydride, pale yellow, m. above 400°; hydrosulfite gives a deep green solution (XVI 1 kg.) and HNO₃ (d. 1.5) at 5° give 330-70 g. of VIIIA, red-orange, m. 320-5°, oxidized by acid or alkaline agents to 2,6,1,4,5,8-Cl₂C₁₀H₂(CO₂H)₄. XVIII (50 g.) and HNO₃ give 18 g. of 1,2,5,6,7,10-hexachloropyrene-3,8-quinone, red-orange, m. 282°. XIX (20 g.) yields 7 g. 1,2,4,5,6,7,9,10-octachloropyrene-3,8-quinone, red-orange, m. 304°. II and Cl in C₆H₃Cl₃ at 100° give 4,5,9,10-tetrachloro-4,5,9,10-tetrahydroxyrene-3,8-quinone, yellow which loses HCl on heating at 250° or on distilling with steam from a suitable solvent, to give 4,9-dichloropyrene-3,8-quinone (XX), red-brown, does not m. 500°; the Cl is non-reactive toward boiling PhNH₂ or p-MeC₆H₄NH₂. II and 1 mol. SO₂Cl₂ in PhNO₂ at 100° give about 50% of 5-chloropyrene-3,8-quinone, reddish brown, m. 248°, and about 15-20% XX. Chlorination of II in C₆H₃Cl₃ at 150-70° yields the 4,5,9,10-tetra-Cl derivative, red-orange, m. 377°; HNO₃ in H₂SO₄ gives 1,4,5,8-Cl₄H₄(CO₂H)₄. 3,8-Dimethoxypyrene (XXI), m. 245°, results from the crude 3,8-dihydroxyrene and a slight excess of Me₂SO₄ in dilute EtOH-NaOH; concentrated H₂SO₄ gives a yellow solution; the EtOH solution has a blue fluorescence. The 5,10-di-Cl derivative of XXI, yellowish green, m. 279°, results from 1 mol. XXI in C₆H₃Cl₃, 2 mols. CaCO₃ and 2.25 mols. SO₂Cl₂ after 1 h. at 150° or by reduction of 5,10-dichloropyrene-3,8-quinone with PhNHNH₂ in C₆H₃Cl₃ and methylation of the hydroquinone (golden yellow, m. above 350°) in aqueous Me₂CO with alkali and Me₂SO₄. The action of 1 mol. SO₂Cl₂ upon XXI in 10 parts PhCl and 1 mol. dioxane gives the 5-Cl derivative, m. 215°; dilute organic solns. show a violet fluorescence. Reduction of XX in 20 parts C₆H₃Cl₃ with PhNHNH₂ at 130-40° gives 4,9-dichloro-3,8-dihydroxyrene, golden yellow, m. 274°; the di-Me ether (4,9-di-Cl derivative of XXI) m. 256°; the H₂SO₄ solution is brick red. The action of 2-4 mols. of HNO₃ in AcOH upon II gives only the 5-NO₂ derivative, red-brown, m. 335° (decomposition); it forms a green vat with an intense blue fluorescence; shaking with air gives a deep black product, which may be the 5-NH₂ derivative or its automer. XXI with HNO₃ in boiling AcOH gives 80% of the 5,10-di-NO₂ derivative, red needles with bronze luster, m. 357° (decomposition); organic solns. show a deep green fluorescence; catalytic reduction with PhNHNH₂ in C₆H₃Cl₃ yields the di-NH₂ derivative, greenish yellow, m. 320°; it is easily oxidized in the air; the red EtOH solution shows a blue fluorescence. With NaNO₂ in PhCl-AcOH XXI gives the 5-NO₂ derivative, red, m. 237°; further nitration in AcOH gives the di-NO₂ derivative; catalytic reduction yields the 5-NH₂ derivative, light yellow, m. 255°; Ac derivative, m. 264°. 1,3,6,8-Tetrachloropyrene-5,10-quinone (XXII) (37 g.) and PhNH₂, stirred

at 50° for 1 h., give about 30 g. of the 1-anilino derivative, dark violet, m. 269-70°; the concentrated H₂SO₄ solution is olive-green, changing to red-brown; the golden yellow vat dyes cotton a bluish green tint XXII (37 g.), 25 g. AcONa.3H₂O and 400 cc. PhNH₂, heated 2 h. at 130-40°, give 40 g. of the 1,6-dianilino derivative (XXIII), dark bluish green, m. 335°; the yellow vat dyes cotton a clear yellowish green; the concentrated H₂SO₄ solution is bluish green, changing to red-brown. Boiling XXII in PhNH₂ (with a little Cu) for 1 h. gives 1,3,6,8-tetranilinopyrene-5,10-quinone, dark steel-blue leaflets, m. 390-5°; the concentrated H₂SO₄ solution is a pure reddish blue. Heating 18.5 g. VIIIA with 24 g. AcOK in 200 cc. PhNO₂ for 15 min. gives 63 (11.2 g.) of 1-hydroxy-3,6,8-trichloropyrene-5,10-quinone, red-brown, m. 322° (decomposition); on shaking the yellow vat with air the violet Na salt ppts.; the concentrated H₂SO₄ solution is yellow-green (thin layer) or blue-green (thick layer) with a red dichroism. Passing NH₃ into solution of 18.5 g. of XXII until the orange color changes to carmine gives 6.4 g. of the 1-NH₂ derivative, violet needles with metallic luster, m. above 350° (decomposition); the vat is brownish yellow with a violet bloom; the concentrated H₂SO₄ solution is greenish blue or olive-green (thin and thick layers); Bz compound, brown with metallic luster, m. 323°. XXII (73 g.), 20 g. p-MeC₆H₄NH₂ and 10 g. AcONa in 500 cc. PhCl, boiled 3 h. give 36 g. of the 1-p-toluidine derivative, dark violet, m. 297°; warming with 60° B. act. e. H₂SO₄ at 100° gives the carbazole derivative, C₂₃H₁₀O₂NCl₃, dark brown leaflets, soluble in concentrated H₂SO₄ with a red-violet color. XXIII and AlCl₃ in C₆H₆ give a dicarbazole derivative, C₂₈H₁₂O₂N₂Cl₂, green, m. 338°; the bath is golden yellow with a blue and then a green bloom and dyes cotton a green tone; the olive-green H₂SO₄ solution changes to brownish yellow and then green on warming. The addition of 300 g. 2,6-Cl₂O₂H₆(O₂Bz)₂ to 2.4 kg. AlCl₃-NaCl melt at 40° and heating at 170° for 0.75 h. give 298 g. 1,6-dihydroxy-3,4,8,9-dibenzopyrene-5,10-quinone (XXIV), from which sublimation at 450-500° gives 129 g. (35%) of pure product, brown-red with metallic luster, m. above 450°; the H₂SO₄ solution is carmine-red; 18 g. with 20 g. p-MeC₆H₄SO₃Me give 15.7 g. of the dMe ether (XXV), brownish red, m. 360°; it does not form a vat; the concentrated H₂SO₄ solution is carmine-red. On boiling 36.5 g. XXV and 120 g. PCl₅ in 200 cc. PhCl for 0.5 h., there results 25 g. of a keto chloride (containing about 3 atoms Cl and 1 of O) which, on saponification with concentrated

H₂SO₄ at

100° (5 min.) and addition of H₂O (temperature 140°), gives 20 g. 1,6-dichloro-3,4,8,9-dibenzopyrene-5,10-quinone, (XXVI), golden yellow, m. above 400°; the concentrated H₂SO₄ solution is reddish violet and the alkaline vat is red. On heating XXIV with more than twice the amount of PCl₅, the yellow keto chloride goes into solution and there results 1,5,6,10-tetrachloro-3,4,8,9-dibenzopyrene, orange-brown, m. 336°; concentrated H₂SO₄ at 130-50° gives XXVI. Boiling XXV or XXVI with p-MeC₆H₄NH₂ gives the 1,6-di-p-toluidino derivative, dark violet, m. 379-80°; the concentrated H₂SO₄ solution is brownish red; a H₂O-soluble sulfonic acid dyes cotton a clear yellowish green. The dianhydride of 2,6,1,4,5,8-Cl₂C₁₀H₂(CO₂H)₄ (8.5 g.) in 100 cc. AcOH and 5 g. PhNH₂ on warming, give 2,6-dichloronaphthalene-1,4,5,8-tetracarboxylic diphenylimide (XXVII), nearly colorless, m. 400°; concentrated H₂SO₄ gives a pale yellow color; the alkaline hydrosulfite solution is bluish green with a deep red fluorescence; heating the dianhydride in PhNH₂ alone gives 90% of the 2,6-dianilino derivative of XXVII, dark blue with metallic luster, m. 400°; the concentrated H₂SO₄ solution is reddish blue and on standing gives a H₂O-soluble sulfonic acid which dyes wool clear blue. I (50 g.) in 3.2 l. CCl₄, treated with 400 g. ClSO₃H at 0-5° for 6 h., gives 550 g. light yellow pyrene-3-sulfonic acid; the sulfochloride, pale yellow, m. 120° (decomposition); the Na salt and NaOH, heated 0.25 h. at 290°, give 3-hydroxypyrene, m. 179°; it does not couple with diazotized aromatic amines; Ac derivative, m. 102°; Me ether, m. 93°. Nitration of I in AcOH with HNO₃ (d. 1.4) at 50° gives

115 g. of the 3-NO₂ derivative (XXVIII), golden yellow, m. 153-4°. Dropping 135 g. POCl₃ into a mixture of 135 g. formylmethylaniline and 100 cc. o-C₆H₄Cl₂ at 25° during 2 h. and then adding 100 g. I and again stirring at 90-5° for 2 h. give 61 g. of pyrene-3-aldehyde (XXVIII), yellow, m. 126°; phenylhydrazones, yellow, m. 201-2°. I with Ac₂O and AcOH (ZnCl₂) gives 3-acetylpyrene (XXIX), yellow, m. 90°; BzCl with AlCl₃ in C₆H₆ gives the 3-Bz derivative (XXX), yellow, m. 128°; oxime, pale yellow, m. 220°; rearrangement with PCl₅ in C₆H₆ gives pyrene-3-carboxyanilide, pale yellow, m. 255°. Reduction of 130 g. of XXVII with NaSH in dilute EtOH gives 92 g. of 3-aminopyrene, light yellow, m. 117-18°; concentrated H₂SO₄ gives a colorless solution with a violet-blue fluorescence; a derivative, m. 260°. 3-Chloropyrene (236 g.) and 100 g. CuCN, mixed at 150° and then heated during 0.75 h. to 300-40°, give, after sublimation at 300-50°, 170 g. pyrene-3-nitrile (XXXI); pale yellow, m. 153°; the same product results through the Sandmeyer reaction. Oxidation of 120 g. of XXIX in boiling C₅H₅N with hypochlorite (14% active Cl) for 0.5 h. gives 90 g. pyrene-3-carboxylic acid (XXI), yellow, m. 274°; hydrolysis of XXXI with NaOH in an iron autoclave at 180° gives a quant. yield of XXXII; the acid chloride, yellow, m. 152°; the anilide, pale yellow, m. 255°. Addition of 50 g. XXX to a melt of 500 g. AlCl₃-NaCl at 120° and heating 10 min. at 160-5° gives 45-8 g. crude and, after sublimation at 350-400°, 17 g. of 2,3(CO)benzoylenepyrene (XXXIII), light golden yellow, m. 242°; the KOH melt of 31.5 g. of XXXIII (245° for 0.25 h.) gives 15 g. of 1-phenylpyrene-o-carboxylic acid, m. 218°; concentrated H₂SO₄ regenerates XXXIII; dry distillation of the Ba salt of the acid gives 1-phenylpyrene, C₂₂H₁₄, m. 169°; the pale rose H₂SO₄ solution with cinnabar-red fluorescence changes to pale blue-green with strong blue fluorescence on warming. Reduction of 20 g. of XXVIII with H₄N₂ (8 h. at 200°, pressure about 100 atmospheric) gives 17 g. 3-methylpyrene, m. 70-1°; it also results in 3-3.5 g. yield by distillation of 5 parts XXXIV and 20 parts soda lime; picrate, brownish red, m. 211-12°; the concentrated H₂SO₄ solution is golden yellow with green fluorescence, changing to olive-green with violet fluorescence on warming. I (400 g.) and 21 g. ClCH₂CO₂H in 1 l. o-C₆H₄Cl₂, heated at 180-90° for 200 h., give 50 g. of 3-pyrenylacetic acid (XXXIV), m. 220° (decomposition), purified through the NH₄ salt; the yellow H₂SO₄ solution has a green fluorescence; the dilute alkaline solution has a violet-blue fluorescence. Distillation of 20 g. of

XXIX

with 100 g. Zn gives 8 g. of 3-ethylpyrene, m. 94-5°; the concentrated H₂SO₄ solution is orange-yellow with strong green fluorescence, which changes to carmine-red with a violet-blue fluorescence on slight warming and longer standing. I (200 g.) and 250 cc. ClCH₂COCl in 2 l. CS₂ with 400 g. AlCl₃ give 90 g. 3,8-dichloroacetylpyrene (XXXV), light brownish yellow, m. 270°, and 90-100 g. of the 3,10-isomer (XXXVI), light yellow, m. 202°, separated by crystallization from PhNO₂. Hypochlorite oxidation of XXXV in dilute BuOH-EtOH gives 92% of pyrene-3,8-dicarboxylic acid (XXXVII) light yellow powder, m. above 365° (decomposition); XXXVI gives the same yield of the 3,10-isomer (XXXVIII), light yellow, m. above 365° (decomposition). The acid chlorides m. 262° and 235°, resp.; a- and b-aminoanthraquinones give yellow to reddish orange vat dyes. The chloride of XXXVII (13.2 g.) and AlCl₃ in C₆H₆ give 12 g. 3,8-dibenzoylpyrene (XXXIX), yellow, m. 239°; that from XXXVIII yields the 3,10-isomer (XL), m. 165°. I (202 g.) and 400 g. AlCl₃ in 2 l. CS₂ with 280 g. BzCl give 53 g. XXXIX and 177 g. of XL.

Ring closure of XXXIX with AlCl₃-NaCl at 140-60°, while a stream of O₂ is passed through the melt, gives 80% of pyranthrone (XLI); XL gives a nearly black product, which contains about 30% of XLI, probably due to a wandering of the Bz group. Oxidation of 30 g. of XXXIX with CrO₃ in boiling AcOH gives 17.5 g. of 3,8-dibenzoylpyrene-5,10-quinone, orange-red m. 292°; it gives a carmine-red vat; molten AlCl₃-NaCl at 140-50° (with addition of O₂) gives dihydroxypyranthrone; di-Me ether,

brownish red powder. XL gives the isomeric 3,10-dibenzoylpyrene-5,8-quinone, orange-red, m. 242°. Nitration of 100 g. I in AcOH at 90° gives 135-40 g. of a mixture of the di-NO₂ compds., from which only the 3,8-di-NO₂ derivative, light yellow, m. 309°, could be isolated. Reduction of the mixed di-NO₂ derivs. with Na₂S in dilute EtOH and separation of the sulfates gives 3,8-diaminopyrene, m. 232-3°, and the 3,10-isomer, m. 160-2°; the yield of each isomer is 22-5 g. from 100 g. crude di-NO₂ compds. The di-Ac deriv. m. 410° and darken about 350°, resp. Nitration of 3-acetaminopyrene, catalytic reduction (Ni in EtOH at 60-70°) and crystallization from C₅H₅N give 3-amino-8-acetaminopyrene, olive-green, m. 280° and the 10-acetamino isomer, yellow, m. 250-1°. I and HNO₃ (d. 1.5) at 80° for 20 min. give 58% of the 3,5,8,10-tetra-NO₂ derivative, light yellow, m. 332°. 3,5,8,10-Tetrabromopyrene (110 g.) and 90 g. CuCN in 1200 g. PhCH₂CN, boiled about 1 h., give 65 g. 3,5,8,10-tetracyanopyrene (XLII), yellow, m. 450°. Hydrolysis of 80 g. XLII in 100 cc. EtOH and 2 l. 10% NaOH (10 h. at 180°) gives 94 g. pyrene-3,5,8,10-tetracarboxylic acid; tetrachloride (XLIII), yellow, m. 226°; tetra-Et ester, m. 194°. XLIII (18 g.) and AlCl₃ in CCl₄-C₆H₆ give 12 g. 3,5,8,10-tetrabenzoylpyrene, light yellow, m. 282°; this also results in moderate yield from I, BzCl and AlCl₃. Tetrachloropyrene (340 g.) and 700 g. AlCl₃ in 4 l. C₆H₆ give 53% of 3,5,8,10-tetraphenylpyrene (XLIV), pale yellow, m. 299-300°; the solution in 20% oleum is pure blue. CrO₃ oxidation of 101 g. of XIV in AcOH gives 65 g. of 1,4,5,8-tetrabenzoylnaphthalene, m. 373°. 3-Chloropyrene (23.6 g.) in 250 cc. C₆H₆ and 50 g. AlCl₃, heated 10 min. at 50°, give 4.5 g. XLIV and 2 g. 2,3,3',2'-dipyrenylene, C₃₂H₁₆, m. 213-14°; the C₆H₆ and AcOH solns. are deep yellow and have an intense yellow-green fluorescence. I (404 g.) and 300 g. o-C₆H₄(CO)₂O in 1.5 l. C₆H₆ with 300 g. AlCl₃, heated 1 h. at 40-50°, give 560 g. of light yellow 3-pyrenoyl-o-benzoic acid (XLV), m. 225-6°. Heating 300 g. XLV in 1.1 l. of a-ClO₂H₇Cl with 360 g. BzCl for 1 h. gives 150 g. of 3,4-phthaloylpyrene (XLVA), orange-red, m. 254°. Addition of 40 g. I to a mixture of 100 g. C₆H₄(CO)₂O, 530 g. AlCl₃ and 110 g. NaCl and heating 1 h. at 150-60° give 5-10 g. diphthaloylpyrene, brownish orange, does not melt at 420°. Details are given of the preparation of 3,4-benzopyrene (XLVI). Distillation of 3,4,8,9-dibenzopyrene-5,10-quinone gives 3,4,8,9-dibenzopyrene, golden orange, m. 315°. Oxidation of 17 g. XLVI in 340 cc. AcOH with 22 g. CrO₃ in 44 cc. H₂O gives 12 g. of 3,4-benzopyrene-5,10-quinone, golden orange, m. 295° (3,4-benzo-5,8-diacetoxypyrene, light yellow, m. 242°), and the 5,8-quinone, orange-red, m. 245° (diacetate, light yellow, m. 204°). XLVI (10 g.) in 350 cc. AcOH and 50 g. CrO₃ in 50 cc. H₂O give 5 g. of benzanthrone-p-dicarboxylic anhydride, golden yellow, m. 364-5°. 3-Aminopyrene, 3-nitropyrene, C₃H₅(OH)₃ and concentrated H₂SO₄ give 3(N)-4-pyridinopyrene(pyrenoline), yellow, m. 157°; oxidation of 30 g. with CrO₃ in H₂O gives 22 g. of 3(N)-4-pyridinopyrene-5,10-quinone (XLVII), yellow-orange, m. 330°; the yellow-brown vat dyes cotton a greenish yellow tone. XLVII in C₅H₅N with hypochlorite gives 70% of 8-azobenzanthroneperidicarboxylic acid, yellow, m. 349°; o-C₆H₄(NH₂)₂ gives a benzimidazole derivative, orange-red; distillation of the Ba salt gives 8-azobenzanthrone, yellow, m. 159-60° (German pat. 600,626, cf. C. A. 28, 1060.2). XXVIII (14 g.), 35 g. CH₂(CO₂Et)₂ and 70 g. Ac₂O, refluxed 1.5 h., give 15.8 g. di-Et 3-pyrenalmalonate, yellow, m. 114°; 75 g. of the ester give 52 g. of the free acid (XLVIII), golden yellow, which, heated at 230°, yields 3-pyrenyl-b-acrylic acid, light yellow, m. 270° (80% yield). With ZnCl₂ in Ac₂O at 60° 32 g. XLVIII yields 20 g. pyrene-3,2-indenone-a-carboxylic acid (XLIX), dark violet with metallic luster, decomps. 302-3°; very characteristic of XLIX is the clear yellow-green solution in concentrated H₂SO₄, which has a deep red fluorescence. Pyrene-2(CO)-3-indenone-a-carboxylic acid (1 g.) on Zn distillation yields 0.2 g. 1,8,9-naphthanthrene (L), light yellow, m.

135°; it also results on distillation of 1,8,9-naphthanthrone with Zn. Oxidation of L or 1,8,9-naphth-10-anthrone with CrO₃ in AcOH gives 1,8,9-naphthanthrone-10-(naphth-1,2)-quinone, orange-red or dark red, m. 378° (decomposition); the phenazine derivative, light yellow, m. 339° (not sharp). The KOH melt of XLVA at 195-215° gives 50% of pyrene-4-carboxylic acid, light gray, m. 326°; acid chloride, yellow, m. 166°; Me ester, m. 136°; Et ester, m. 117°; hydrazide (LI), m. 230°; di-4-pyrenoylhydrazine, m. 368-9°; Ac derivative of LI, m. 290° (decomposition). LI with HNO₂ and Ac₂O yields 67% of the Ac derivative, pale yellow, m. 227-9°, for 4-aminopyrene, (LII), yellow, m. 207°. KOH fusion of 300 g. of the Na salt (LIII) of pyrene-4-sulfonic acid gives 73 g. 4-hydroxypyrene, m. 206-7°; this also results in 6.2 g. yield from 21 g. LII through the Sandmeyer reaction; it couples with diazotized aromatic amines (p-O₂NC₆H₄NH₂ gives a brownish red dye); Ac derivative, m. 114°; Me ether, m. 105-6°. 3-Aminopyrene sulfate (300 g.) in 2 l. o-C₆H₄Cl₂, refluxed 4 h., gives 120-50 g. of the Na salt (LIV) of 2-aminopyrene-4-sulfonic acid, fine needles; the free acid with HNO₂ gives LIII. LIV through the Sandmeyer reaction yields 3-cyanopyrene-4-sulfonic acid, whose Na salt is light yellow; the sulfochloride m. 265°. Pyrene-4-nitrile, (LV), pale yellow, m. 203-4°, results in 1.2 g. yield from 3 g. pyrene-4-carboxamide and PCl₅ in C₆H₃Cl₃ or in 1 g. yield from 10 g. LIII and 15 g. KCN by distillation of the mixture and N₂H₄.H₂O, heated 2 h. at 200° (pressure, 85-100 atms.) give 4-methylpyrene, m. 143-3.5° (described by Cook and Hewett as the 1(= 3)-methylpyrene). Hexahydropyrene (LVI) (21 g.) and 16 g. Br in CS₂ at room temperature give 1-bromo-3,4,5,8,9,10-hexahydropyrene, m. 310-1°, while 50 g. LVI and 30 cc. Br in 600 cc. PhNO₂ at room temperature yield 55 g. of the 1,6-di-Br derivative (LVA), m. 194°; LVI (21 g.) in 100 cc. SO₂Cl₂ and 0.2 g. AlCl₃ at room temperature yield 16 g. of the 1,6-di-Cl derivative, m. 182-3°. LVI (21 g.) and 12 g. ClSO₃H in PhNO₂ at 16-25° give the 1-sulfonic acid (Na salt, needles); this did not yield 1-hydroxypyrene on melting with KOH or NaOH; on allowing 10 g. LVI in 100 cc. concentrated H₂SO₄ to stand overnight at room temperature there results the 1,6-disulfonic acid (di-Na salt, long needles); the alkali melt did not yield definite products. LVI (20 g.), 8 g. AcCl and 16 g. AlCl₃ in 200 cc., stirred 2 h. at room temperature, give the 1-Ac derivative (LVI), pale yellow, m. 85-6°; the concentrated H₂SO₄ solution is carmine-red; 21 g. LVI 17 g. AcCl and 30 g. AlCl₃ in 200 cc. CS₂, 3 h. at room temperature, give 90% of the 1,6-di-Ac derivative LVIII, m. 182°; concentrated H₂SO₄ solution, golden yellow. Oxidation of LVII with hypochlorite in C₅H₅N gives hexahydropyrene-1-carboxylic acid, m. 241°, while LVIII yields the 1,6-dicarboxylic acid, yellow, m. 332° (decomposition). LVI (20 g., 15 g. BzCl, 15 g. AlCl₃ and 200 cc. CS₂ give the 1-Bz derivative, yellow, m. 109°; 24 g. BzCl and 24 g. AlCl₃ give the 1,6-di-Bz derivative, yellow, m. 275°. LVA (90 g.) and 55 g. CuCN, boiled 1 h., give 45 g. of the 1,6-dicyano derivative (LIX), pale yellow, m. 303°; if the reaction is heated to 320-50° the product is pyrene-1,6-dinitrile (LX), m. 406° (6 g. from 20 g. LVA; it also results in 87% yield from LIX and Se in boiling N-ethylcarbazole). Hydrolysis of 26 g. LX with 65 g. KOH and 250 cc. EtOH (4 h. at 180°) gives 22 g. pyrene-1,6-dicarboxylic acid (LXI), decomps. about 420°. Addition of 29 g. LXI to a mixture of 50 g. PCl₃, 300 cc. C₆H₃Cl₃ and 20 g. Cl₂ and heating to 170-80° give the dichloride, which, reacted with C₆H₆ and AlCl₃ (1 h. boiling), gives 35 g. 1,6-dibenzoylpyrene (LXII), light yellow, m. 237°; there also results a compound, probably 1-benzoylpyrene-6-carboxylic acid, pale yellow, m. 252°. Addition of 30 g. LXII to a melt of 700 g. AlCl₃ and 87 g. NaCl and heating to 140-50° while O₂ is passed through the mixture give 20-5 g. of 1-(CO)-10,6-(CO)-5-dibenzoylenepyrene, dark red needles with metallic luster; alkaline hydrosulfite in the cold gives the dark violet Na salt of the leuco compound, which on warming gives a violet solution; this dye has bluish red tones. I (100 g.) in 1 l. AcOH, treated with O₃ for 14 h.

(60-90 l. of O₂ containing 1.5-3 g. O₃), the ozonide decomposed with H₂O and the light brown resin oxidized with HOCl, give 25-42 g. of phenanthrene-4-aldehyde-5-carboxylic acid, (LXIII), m. 276°; oxidation of 10 g. with CrO₃ in AcOH gives 5.4 g. of phenanthrenequinone-4,5-dicarboxylic acid, yellow, m. 298° (decomposition); o-C₆H₄(NH₂)₂ gives an azine, crystallizing from H₂O as the anhydride, pale yellow, m. 340°. LXIII (10 g.) with alkaline KMnO₄ gives 4.4 g. of diphenyl-2,2',6,6'-tetracarboxylic acid, m. 390° (decomposition). Pyrene-1,2-quinone (LXIV), golden orange, m. 310° results in 11 g. yield on oxidizing the LXVI from 19.2 g. LXV or in 0.5 g. yield from the alkali melt of 1.5 g. LXIII; azine, yellow, m. 262°, giving a blue-green color in concentrated H₂SO₄; alkaline hydrosulfite gives a yellow vat, from which air ppts. LXIV. Further oxidation of LXIV with CrO₃ in AcOH at 90° gives pyrene-1,2,6,7-diquinone, yellow, m. 365° (decomposition); the diphenazine derivative, light yellow, m. 420°. LXIII (12.5 g.) and PhNHNH₂ in AcOH give 11.3 g. of 1-hydroxy-2-phenylazopyrene (LXV), light red with greenish metallic luster, m. 197°; SnCl₂ in HCl-AcOH gives 90% of the HCl salt, leaflets, of 1-hydroxy-2-aminopyrene (LXVI), light grayish yellow, does not m. 400°. LXIII (50 g.) in 400 cc. AcOH and 50 g. N₂H₄·H₂O, refluxed 0.5 h., give 32.4 g. 1-hydroxypyrene (LXVII), brownish, m. 206-7°; it also results in about 1 g. yield by reduction of LXIV with SnCl₂ in concentrated HCl-AcOH by heating in an autoclave for 5 h. at 150°; with PhN₂Cl LXVII yields LXV; Ac derivative of LXVII, pale yellow, m. 113-14°. Heating 100 g. LXVII with 4 l. concentrated NaOH and 400 cc. (NH₄)₂SO₃ solution 8 h. at 150° gives 70-80 g. of 1-aminopyrene, light yellow, m. 182°. LXVII (20 g.), 300 g. 80% H₂SO₄ and 20 g. C₃H₅(OH)₃, heated at 120-5° for 0.75 h., give 6 g. 1,8,9-naph-10-throne, brownish yellow, m. 243°; it also results from I, C₃H₅(OH)₃ and H₂SO₄. Finally there is a discussion of the distribution of the valencies in I.

IT 50-32-8P, Benzo[a]pyrene 81-29-8P, Pyrene, 1,3,6,8-tetrachloro-128-63-2P, Pyrene, 1,3,6,8-tetrabromo- 128-70-1P, 8,16-Pyranthrene-1,2-dione 128-97-2P, 1,4,5,8-Naphthalenetetracarboxylic acid 188-91-0P, Dinaphtho[2,1,8-cde,2',1',8'-lmn]perylene 189-64-0P, Dibenzo[a,h]pyrene 189-92-4P, Pyrenoline 193-10-2P, Phenanthro[4,5-abc]phenazine 548-39-0P, 1H-Benzonaphthen-1-one 1606-67-3P, 1-Pyrenamine 1732-24-5P, Acetamide, N-2-pyrenyl- 1732-23-6P, 2-Pyrenamine 1732-25-8P, Pyrene, 4-bromo-1,2,3,6,7,8-hexahydro- 1785-51-9P, 1,6-Pyrenedione 1903-15-7P, 2-Pyrenecarbonitrile 2304-85-0P, 1,8-Pyrenedione 2381-21-7P, Pyrene, 1-methyl- 3029-19-4P, 1-Pyrenecarboxaldehyde 3067-13-8P, Benzo[a]pyrene-1,6-dione 3067-14-9P, Benzo[a]pyrene-3,6-dione 3074-00-8P, 6-Benzo[cd]pyren-6-one 3264-21-9P, Ketone, methyl 1-pyrenyl 3442-78-2P, Pyrene, 2-methyl- 4107-64-6P, 1-Pyrenecarbonitrile 4371-27-1P, 2,2',6,6'-Biphenyltetracarboxylic acid 4389-13-3P, 7H-Benz[de]anthracene-3,4-dicarboxylic anhydride, 7-oxo- 4389-13P, 1-Anthra[2,1,9-def][2]benzopyran-1,3,6-trione 5315-79-7P, 1-Pyrenyl 5355-83-9P, 1,6-Pyrenedione, 3,5,8,10-tetrachloro- 5385-03-5P, 1,6-Pyrenedione, 5-anilino-3,8,10-trichloro- 5385-09-1P, 1,6-Pyrenedione, 3,5,8-trichloro-10-hydroxy- 5522-43-0P, Pyrene, 1-nitro- 5684-15-1P, 4-Phenanthrenecarboxylic acid, 5-formyl- 5839-21-4P, 7-Naphtho[1,8-gh]quinolin-7-one 6169-92-2P, 1-Benzonaphthene-6,7-dicarboxylic acid, 1-oxo- 6217-22-7P, 4,5-Pyrenedione 6424-54-0P, 1,6-Pyrenedione, 5,10-dianilino-3,8-dichloro- 6596-36-7P, 1,8,9-Naphthanthrene 7267-88-1P, Pyrene, 4-phenyl- 7267-89-2P, 8-Dibenzo[b,fg]pyren-8-one 7376-03-6P, Ketone, phenyl 1-pyrenyl 7416-74-2P, 1,6-Pyrenedione, 5-amino-3,8,10-trichloro- 7416-74-2P, 1,6-Pyrenedione, 5-amino-3,8,10-trichloro-, Bz derivative 10103-10-3P, Pyrene, 1,6-dimethoxy- 12303-69-4P, 6-Benzo[cd]pyrene 13638-82-9P, Pyrene, 1,3,6,8-tetraphenyl- 13638-83-0P, Naphthalene, 1,4,5,8-tetrabenzyl- 14260-45-8P, Pyrene, decachloro- 14727-42-5P, 1,6-Pyrenedione, 3,5,8-trichloro-10-p-toluino- 14727-71-0P, 4,5,9,10-Pyrenetetrone

14923-84-3P, 1,6-Pyrenediamine 16331-58-1P, 1-Pyrenecarbonyl
 chloride 17075-03-5P, 4-Pyrenamine 17088-22-1P, Pyrene, 1-ethyl
 18084-46-3P, 1,6-Pyrenedione, 3,5,8,10-tetraanilino- 18084-54-3P,
 1,6-Pyrenedione, 3,8-dichloro- 19694-02-1P, 1-Pyrenecarboxylic acid
 22006-12-8P, 1,4,5,8-Naphthalenetetracarboxylic diimide,
 2,6-dichloro-N,N'-diphenyl- 22245-62-1P, Pyrene, 1-(2,2-dicarboxyvinyl)-
 22245-62-1P, Malonic acid, 1-pyrenylmethylene- 22755-15-3P, Acetamide,
 N-1-pyrenyl- 23486-82-0P, 1-Benzonaphthene-6,7-dicarboxylic anhydride,
 1-oxo- 23801-28-7P, Pyrene, 2-methoxy- 26651-23-0P, 1-Pyrenesulfonic
 acid 28496-11-9P, 1,3,6,8-Pyrenetetracarboxylic diimide 28767-61-5P, Pyrene,
 1,3,6,8-tetranitro- 30269-04-6P, 1,8-Pyrenediamine
 31700-39-7P, 4-Pyrenol 32692-38-9P, Pyrene,
 1,3,4,5,6,8,9,10-octachloro-4,5,9,10-tetrahydro- 34107-15-8P, Pyrene,
 1,3,6,8-tetrabenzoyl- 34244-14-9P, Pyrene, 1-chloro- 34246-96-8P,
 Pyrene, 1-methoxy- 35147-76-3P, 1,3,6,8(2,7)-Pyrenetetrone
 38251-36-4P, 2-Pyrenesulfonic acid, Na salt 42286-47-5P,
 Benzo[a]pyrene-3,6-diol, diacetate 42499-08-1P, Benzo[a]pyrene-3,6-diol,
 diacetate 54811-16-4P, Pyrene, 1,6-dibenzoyl- 55006-40-1P,
 4,9-Pyrenedicarbonitrile 55009-76-2P, Pyrene, 1,8-dibenzoyl-
 55217-39-5P, 1-Pyrenecarboxaldehyde, phenylhydrazone 58926-23-1P,
 Pyrene, 1-o-carboxybenzoyl- 58926-23-1P, Benzoic acid,
 o-1-pyrenylcarbonyl- 59323-54-5P, 1-Pyrenesulfonic acid, Na salt
 59723-21-6P, 1,4,5,8-Naphthalenetetracarboxylic dianhydride, 2,6-dichloro-
 59723-35-2P, 1,4,5,8-Naphthalenetetracarboxylic dianhydride, 2,7-dichloro-
 59808-28-5P, Pyrene, hexachloro- 61198-29-6P,
 1,3,6,8(2,7)-Pyrenetetrone, 2,7-dinitro- 61494-52-8P, 1-Pyrenesulfon-
 chloride 64094-19-5P, 2-Pyrenesulfonic acid, 1-amino-, Na salt
 64094-22-0P, 4-Pyrenesulfonic acid, 1,2,3,6,7,8-hexahydro-, Na salt
 64350-83-0P, 2-Pyrenesulfonic acid 64709-55-3P, 1-Pyreneacetic acid
 65593-62-6P, 1,6-Pyrenedione, 3-chloro- 68516-49-4P,
 1,3,6,8(2,7)-Pyrenetetrone, 2,7-dibromo- 70200-28-1P, Ketone,
 1,2,3,6,7,8-hexahydro-4-pyrenyl methyl 72572-56-6P, 4-Pyrenol, acetate
 78751-40-3P, 1-Pyrenol, acetate 78751-58-3P, 2-Pyrenol 78751-60-7P,
 2-Pyrenol, acetate 78751-68-5P, 2-Pyrenesulfonic acid, 1-amino-
 79077-03-5P, 1,4,5,8-Naphthalenetetracarboxylic dianhydride, tetrachloro-
 83244-76-2P, Naphtho[2,3-a]pyrene-7,12-dione 88535-49-3P,
 4-Pyrenecarboxylic acid, 1,2,3,6,7,8-hexahydro- 90814-80-5P, Pyrene,
 1,6-bis(chloroacetyl)- 90814-81-6P, Pyrene, 1,8-bis(chloroacetyl)-
 91816-89-6P, 1-Pyreneacrylic acid 96918-18-2P, 1-Pyrenecarboxanilide
 99387-36-7P, Acetamide, N-[8-amino-1-pyrenyl]- 99387-37-8P
 , Pyrene, 1,8-diacetamido- 102591-70-8P, Ketone,
 1,2,3,6,7,8-hexahydro-4-pyrenyl phenyl 102595-35-7P, Pyrene, 1-methyl-,
 picrate 103164-90-5P, Pyrene, 4,9-dibenzoyl-1,2,3,6,7,8-hexahydro
 103283-43-8P, Dinaphtho[2,3-b,2',3'-i]pyrene-5,9,14,18-tetrone
 109555-45-5P, 2-Pyrenecarbonyl chloride 110299-23-5P,
 1,6-Pyrenedicarboxylic acid 123784-69-0P, Pyrene,
 4,9-dibromo-1,2,3,6,7,8-hexahydro- 123784-70-3P, 4,9-Pyrenedicarboxylic
 acid, 1,2,3,6,7,8-hexahydro- 127856-68-2P, Pyrene,
 1-(2,2-dicarboxyvinyl)-, diethyl ester 127856-68-2P, Malonic acid
 1-pyrenylmethylene-, diethyl ester 145074-77-7P, 1,6-Pyrenedicarbonyl
 chloride 294192-22-6P, Dibenzo[a,h]pyrene-7,14-dione, 6,13-dichloro-
 321580-18-1P, 1,4,5,8-Naphthalenetetracarboxylic diimide,
 2,6-dianilino-N,N'-diphenyl- 358740-72-4P, 1,3,6,8-Pyrenetetracarboxylic
 acid, tetraethyl ester 361391-64-2P, 4,5-Phenanthrenedicarboxylic acid,
 9,10-dihydro-9,10-dioxo- 838836-76-3P, 1,8-Pyrenedicarboxylic acid
 853925-25-4P, 2-Benzo[cd]pyrene-1,2,6-trione 854393-25-2P,
 Dibenzo[a,h]pyrene-7,14-dione, 6,13-dihydroxy- 854393-28-5P,
 Dibenzo[ah]pyrene, 6,7,13,14-tetrachloro- 854394-43-7P,
 Dibenzo[a,h]pyrene-7,14-dione, 6,13-di-p-tolueno- 854394-48-2P,
 Oxepo[3',4',5',6',4,5]phenanthro[9,10-b]quinoxaline-4,6-dione
 854394-48-2P, Dibenzo[a,c]phenazine-4,5-dicarboxylic anhydride
 854899-67-5P, 1,6-Pyrenedione, octachloro- 854899-69-7P,
 1,6-Pyrenedione, 3,8-dibenzoyl- 855757-64-1P, Benzoic acid, o-4-pyrenyl-

855757-64-1P, Pyrene, 4-(o-carboxyphenyl)- 855882-23-4P, Acetamid
 N-(3,8-dimethoxy-1-pyrenyl)- 855884-92-3P, Acetamide,
 N-[6-amino-1-pyrenyl]- 856351-59-2P, 5,6-Acenaphthenedicarboxylic
 anhydride, 3,8-dichloro- 858266-95-2P, 1-Pyrenamine, 3,8-dimethox
 858267-30-8P, Pyrene, 3,4-phthaloyl- 858267-32-0P, Pyrene,
 1,3,4,5,6,8,9,10-octachloro- 858267-45-5P, Pyrene, 4,9-dibenzoyl-
 858267-47-7P, Pyrene, 4,9-diacetyl-1,2,3,6,7,8-hexahydro- 858267-48-8P,
 1,6-Pyrenedione, 2,3,7,8-tetrachloro- 858267-49-9P, Pyrene,
 1,6-diacetamido- 858267-50-2P, 1,6-Pyrenedione, 3-nitro- 858267-51-3P,
 Pyrene, 3-chloro-1,6-dimethoxy- 858267-52-4P, 1,6-Pyrenedione,
 3,4,5,8,9,10-hexachloro- 858267-55-7P, 1,6-Pyrenedione, 2,7-dichloro-
 858267-56-8P, 1,6-Pyrenedione, 2,7-dibromo-3,8-dihydroxy-, diacetat
 858267-58-0P, 1,6-Pyrenediol, 2,7-dichloro- 858267-62-6P,
 4,9-Pyrenedicarboxylic acid 858267-64-8P, 1,8-Pyrenedicarbonyl chloride
 858267-66-0P, 4,9-Pyrenedicarbonitrile, 1,2,3,6,7,8-hexahydro-
 858267-70-6P, 1,6-Pyrenolinedione 858267-71-7P, 4-Pyrenecarboxylic acid,
 9-benzoyl- 858267-72-8P, 4-Pyrenol, 5-phenylazo- 858267-74-0P,
 4-Pyrenol, 5-amino-, -HCl 858267-76-2P, 4-Pyrenol, 5-amino-
 858267-78-4P, Pyreno[4,5-b,9,10-b']diindole-3,11-dione,
 1,9-dichloro-4,12-dihydro- 858267-83-1P, 1-Pyreneacetic acid, ammonium
 salt 858267-85-3P, 1,8-Pyrenedione, 3,6-dibenzoyl- 858267-86-4P
 1,6-Pyrenedione, 2,3,7,8-tetrachloro-2,3,7,8-tetrahydro- 858268-71-4P,
 Pyrene, 1,6-dimethoxy-3-nitro- 858268-19-6P, Pyrene,
 1,6-dimethoxy-3,8-dinitro- 858268-21-0P, Pyrene,
 4,9-dichloro-1,2,3,6,7,8-hexahydro- 858268-71-0P, 1,3,6,8-Pyrenetetrol,
 2,7-dibromo-2,7-dihydro-, tetrabenzoate 858434-47-6P,
 7-Naphtho[1,8-gh]quinoline-3,4-dicarboxylic acid, 7-oxo- 859982-84-2P,
 Ketone, phenyl 1-pyrenyl, oxime 861003-03-4P,
 9-Phenanthro[4,5-abc]carbazole-3,8-dione, 1,4,6-trichloro-12-methyl
 861023-15-6P, 1,3,6,8-Pyrenetetrol, 2,7-dibromo- 861023-17-8P,
 1,3,6,8-Pyrenetetrol, tetrabenzoate 861023-19-0P,
 1,3,6,8-Pyrenetetracarboxylic acid 861023-21-4P,
 1,3,6,8-Pyrenetetracarbonyl chloride 861023-22-5P, 2-Pyrenesulfon
 chloride, 1-cyano- 861023-24-7P, 2-Pyrenesulfonic acid, 1-cyano-Na
 salt 861023-26-9P, 2-Pyrenesulfonic acid, 1-cyano- 873382-88-8P
 Pyrene, 2,7-dichloro-1,6-dimethoxy- 873382-88-8P, Pyrene,
 2,7-dichloro-1,6-dimethoxy- 873382-99-1P, Pyrene,
 3,8-dichloro-1,6-dimethoxy- 873382-99-1P, Pyrene,
 3,8-dichloro-1,6-dimethoxy-
 RL: PREP (Preparation)
 (preparation of)